

RANGE EXTENSION AND EMERGENCE OF SUBTERRANEAN NESTING BY THE GERMAN YELLOWJACKET, *VESPULA GERMANICA*, IN NORTH AMERICA (HYMENOPTERA: VESPIDAE)^{1,2}

John F. MacDonald³, Rogers D. Akre⁴

ABSTRACT: The German yellowjacket, *Vespula germanica* (Fab.), has continued to extend its distribution to the west and northwest and now is established in such cities as Minneapolis/St. Paul and Winnipeg. In addition, this species has been found in Nampa, Idaho and in the Seattle area as of 1981-82. However, *V. germanica* had not spread into the south Atlantic states or the southwest.

Previously known only as a structural nester in North America, subterranean colonies of *V. germanica* have appeared in Indiana, where they constituted 38% (11/29) of the colonies studied in the Lafayette area in 1982.

More so than any other yellowjacket species, the German yellowjacket, *Vespula germanica* (Fab.), has displayed a remarkable propensity for becoming distributed and established throughout temperate regions of the world (Edwards 1976). Although periodically introduced into the northwestern United States over the past century, this species probably did not become established until the late 1960's (Morse et al. 1977). Since then, *V. germanica* has spread rapidly and steadily from the northeast into the upper midwest (Fig. 1; Dunn 1980; MacDonald et al. 1980).

The established North American biotype is noteworthy because of its pronounced tendency to nest inside structures, forsaking the typical subterranean nesting site of European conspecifics. Indeed, *V. germanica* in North America was reported as nesting almost exclusively in structures (Dunn 1980; Keyel 1983; MacDonald et al. 1980; Morse et al. 1977). In contrast, other *Vespula* species may occasionally nest inside structures, but they are predominately subterranean nesters (Akre et al. 1981). Thus, structural nesting surfaced as one diagnostic criterion for the presence of *V. germanica* in various communities in eastern North America.

This paper reports the current distribution of *V. germanica* in North America and reveals the emergence of subterranean nesting by this

¹Received July 5, 1983. Accepted August 16, 1983.

²Journal paper number 9526, Purdue Agricultural Experiment Station, W. Lafayette, Indiana. Work supported in part by Purdue Agricultural Experiment Station project number 58045 and Washington State College of Agriculture Research Center, Project 0037.

³Associate Professor, Department of Entomology, Purdue University, W. Lafayette, Indiana 47907.

⁴Professor, Department of Entomology, Washington State University, Pullman, Washington 99164.

species in Indiana.

Distribution of the German Yellowjacket in North America

As predicted, the German yellowjacket has continued its spread west-northwestward as evidenced by recent (1981-82) reports from collaborators plus specimens from Chicago, Milwaukee, Minneapolis/St. Paul, and Winnipeg. To date, we have no specimens (or suspicious reports suggesting establishment) of *V. germanica* westward between the Dakotas and the Pacific northwest, but we feel eventual establishment is inevitable, at least in urban areas.

The first record of the German yellowjacket on the west coast of North America was the collection of workers in Puyallup, Washington in September 1982 (Fig. 1). Initially four poorly preserved specimens, sent to us for identification by a King County extension agent, were tentatively determined to be *V. germanica*. This determination was confirmed during the next several days with nine additional workers collected from the same locality in Puyallup. Subsequently, a worker was collected in a garage in Puyallup, and six males were sent from a colony found in the ceiling of a home in Spanaway, Washington. In addition, a queen *V. germanica* was collected in Puyallup in January 1983. These collections, plus reports of at least three structural colonies in the Puget Sound area that persisted late into the year and chewed through walls of homes, strongly suggest that the German yellowjacket is established in the area.

In March of 1983, workers, queens, and males from a *V. germanica* colony collected in October 1981 were received from Nampa, Idaho. In this case the colony was subterranean and was located inside an abandoned irrigation pipe. Although specific data are lacking, the colony was large and had produced numerous queens.

Despite the efforts of collaborators, *V. germanica* still has not been detected south of Virginia, the southeast or the central midwest. For example, although the German yellowjacket is common in the Indianapolis area, it has not been detected in the southern part of Indiana.

Emergence of Subterranean Nesting in Indiana

Establishment of *V. germanica* in Indiana probably occurred in 1975-76 (Mac Donald et al. 1980). For the last few years, all colonies studied were located inside structures, with just over 87% (69/79) situated inside structural voids, including 57 inside wall voids (Table 1). The first subterranean *V. germanica* colony was discovered in 1980, situated among roots of ivy adjacent to a building; an additional subterranean nest was found in 1980 and another in 1981 (Table 1). However, subterranean nesting became readily apparent in 1982, with 38% (11/29) in such sites as in lawns, shrub beds and in soil behind retaining walls.

Discussion and Implications

The rate of range extension of the German yellowjacket has been far too rapid to be explained by natural dispersal of inseminated queens. Rapid dispersal, initial detection of *V. germanica* in urban areas, and the presence of isolated populations in Idaho and Washington suggest the major mode of dispersal has been via commerce. However, once established in an urban area, natural dispersal by queens occurs, for we have discovered an occasional *V. germanica* colony in rural homes near Lafayette, Indiana the past two years. Thus, while most problems associated with the German yellowjacket occur in urban areas, dwellings in less populated areas are also subject to infestation.

The sudden appearance of *V. germanica* on the west coast suggests that this species may be discovered in other disjunct areas in the near future, at least in the northern portion of the United States and Canada. The continued absence of *V. germanica* in the South remains unexplained, but climatic factors may be responsible (Keyel 1983).

Subterranean nesting in other *V. germanica* populations may already



Fig. 1. Distribution of *V. germanica* in North America as of May 1983.

exist (undocumented) or may develop in the future. Accordingly, we should not continue to rely so strongly on nest site as a criterion for diagnosis of *V. germanica*. It appears our early characterization of the German yellowjacket in North America as an exclusively structural nester was inaccurate.

Table 1. Nest locations of *Vespula germanica* in the Lafayette, Indiana area 1977-82.

Year	Subterranean	NUMBER OF COLONIES				Total
		Enclosed voids ^a	Structural Basements	Attics	Other ^b	
1977	0	5	0	0	0	5
1978	0	11	0	1	0	12
1979	0	10	2	1	0	13
1980	2	8	2	1	1	14
1981	1	18	0	1	0	20
1982	11	17	0	1	0	29
Totals	14 ^c	69	4	5	1	93

^aMost nests inside wall voids; 4 above drop ceilings, 3 above soffits, 3 inside porch voids, 1 in a chimney void.

^bInside a wood duck house suspended in a tree ca. 8m above ground.

^cFive in lawns, 7 in shrub beds, 2 in soil behind retaining walls.

ACKNOWLEDGMENTS

Appreciation is extended to Ron Mundell, Purdue University Exterminator, for his years of cooperation in facilitating research on social wasps on the Purdue campus. We also thank Byron Reid and Donald Ross for assistance in locating many of the yellowjacket colonies. S.J. Collman, A. Antonelli, and A. Stanford provided specimens and records of western *V. germanica*.

LITERATURE CITED

- Akre, R.D., A. Greene, J.F. MacDonald, P. Landholt, and H.G. Davis. 1981. The Yellowjackets of America North of Mexico. USDA Agric. Handbook 552, 102 pp.
- Dunn, G.A. 1980. The introduced yellowjacket in Michigan. Entomol. Soc. Mich. Newsletter. 25: 1,3.
- Edwards, R. 1976. The world distribution pattern of the German wasp, *Paravespula germanica* (Hymenoptera: Vespidae). Ent. Germanica 3: 269-271.
- Keyel, R.E. 1983. Some aspects of niche relationships among yellowjackets (Hymenoptera: Vespidae) of the northeastern United States. Ph.D. Dissertation thesis, Cornell University, Ithaca, New York, 161 pp.
- MacDonald, J.F., R.D. Akre, and R.E. Keyel. 1980. The German yellowjacket (*Vespula germanica*) problem in the United States (Hymenoptera: Vespidae). Bull. Entomol. Soc. Amer. 26: 436-42.
- Morse, R.A., G.C. Eickwort, and R.S. Jacobson. 1977. The economic status of an immigrant yellowjacket, *Vespula germanica* (Hymenoptera: Vespidae), in the north-eastern United States. Environ. Entomol. 6: 109-110.